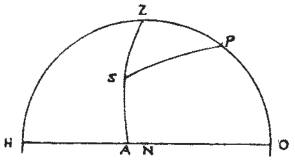
Dr. Kunz cites, among the precious stones mentioned by Shakespeare, a number of substances which, though they can scarcely be reckoned precious, have long been employed in jewelry, such as agate, amber, coral, jet, and rock-crystal. His little volume, though without literary distinction, contains much information on the subject of which it treats, and will be welcomed by lovers of the great dramatist.

IDENTIFICATION OF STARS.

Star Identifier and Diagrams for the Graphical Solution of Problems in Nautical Astronomy. By J. E. McGegan. (London: The London Name Plate Manufacturing Co., and J. D. Potter, 1916.) Price 10*s*. 6*d*. net.

BY the pamphlet and diagrams prepared by Mr. McGegan he suggests a method by which, when an observer has taken an altitude of a star the identity of which is doubtful, he can, if he also observes the compass bearing of the object at the same time, ascertain its declination and right ascension, and thus identify it in the Nautical Almanac.

The problem is very simple, provided the data can be accurately observed, as the annexed diagram will show: where P is the pole, Z the zenith, N the place of the observer, H O the horizon, while S is the star observed which requires to be identified. The arc S A will be its altitude, the arc P O the latitude of the observer. Consequently, the arc Z S will be its zenith distance, and the arc P Z the colatitude, whilst the angle P Z S will be its azimuth, which can be obtained by correcting the compass bearing observed to the true bearing, and then deducting the result from 180° to find the azimuth. There is consequently a spherical triangle P Z S, with two sides and the included angle known, to find the third side P S (the polar distance) and the angle Z P S (the hour angle). By applying the hour angle to the right ascension of the meridian of the place, readily ascertained from the Nautical Almanac, the right ascension of the star is obtained and its declination from its polar distance.



To solve the problem without much calculation Mr. McGegan has ingeniously constructed two diagrams on equal scales, one the diagram of a hemisphere divided into circles of declination from the equator to both poles; and into meridians representing sidereal hour angles, or circles of right ascension; a second diagram on celluloid, which is transparent, represents a semicircle marked in circles of altitude from the horizon to the zenith, and of arcs of azimuth 0° to 90° east and west from the meridian.

There is, in addition, on the diagram of right ascension and declination a quadrant at the side marked from 0° to 90° to represent latitude.

Now if the position of the star by altitude and azimuth be marked on the celluloid semicircle, and the semicircle be placed over the diagram of the hemisphere in such a manner that its centre coincides with the centre of the hemisphere, and its horizon cuts the quadrant marked outside the hemisphere at the latitude of the observer, then the position on the celluloid will show on the diagram of the hemisphere under it the declination and hour angle of the star to be identified.

In actual practice this is seldom, if ever, necessary. Star observations at sea are only of use when the horizon is clear and well defined—for instance, at twilight morning or evening, or when Venus or Jupiter passes the meridian at an interval of more than 2½ hours from noon. When the horizon is well defined the stars are nearly always too faint to enable compass bearings of them to be observed.

Stars on or near the meridian can at twilight nearly always be seen through the sextant, when invisible to the naked eye, if their approximate altitude be placed on the sextant. For longitude only very bright stars are available at twilight, and navigators know well where they are situated and where to look for them.

As the celluloid semicircle easily slips out of its place over the diagram of the hemisphere, it would be an advantage if a screw-pin were placed through the centres of both with a clamp and screwed tightly, when the horizon line had been placed on the appropriate latitude on the side of the diagram of the hemisphere.

AN ARABIC ALGEBRA.

Compendio de Algebra de Abenbéder. Texto árabe, traducción y estudio por José A. Sánchez Pérez. Pp. xlvii+117. (Madrid: E. Mastre, 1916.)

THIS work is "a compendium of algebra composed by the sheikh Abu Abdullah Muhammad b. ‘Umar b. Muhammad, generally known as Ibn Badr." Practically nothing is known about the author, and not much about the date of the treatise. The MS. on which this edition is based was written in A.H. 744 (=A.D. 1343), and the text contains a reference to Abu Kāmil (trans. p. 57, text p. 39) and "his book about algebra." The editor takes this Abu Kāmil to be Abu Kāmil Shuja‘ b. Aslam al-Ḥāsib (the reckoner). The treatise comprises a theoretical part and a collection of problems, or rather a set of numerical examples of particular types, followed by problems relating to practical affairs of commerce, etc. The theoretical range includes (in this order) quadratic equations, quadratic surds, law of integral indices, rule of signs for multiplication (given without any comment), multiplication of ordinary polynomials, division of one monomial by another, rule of transposition. Among the problems we have cases of simultaneous equations of various kinds; and it is clear (p. 70) that the author was acquainted with the arithmetical theory of proportion.

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To a certain extent Ibn Badr makes up formulæ of the type $f(x, y)=0$ or $f(x, y, z)=0$ to solve a whole set of problems; see, for instance, pp. 88–90. He also discusses some problems which lead to linear Diophantine equations; for instance (pp. 90–92), we have the problem:—

"A man sold three kinds of grain, wheat, barley, and millet; the wheat at 4 dirhems per measure (*qafīz*), the barley at 2 dirhems per measure, the millet at half a dirhem per measure. Altogether he sold 100 measures for 100 dirhems; how many measures of each grain did he sell?"

This leads, of course, to the equations $x+y+z=4x+2y+\frac{1}{2}z=100$, and hence to $7x+3y=100$; but Ibn Badr's analysis is quite different from this. The editor concludes (pp. xix–xx) from the occurrence of problems of this type that the author belongs to the twelfth or thirteenth century.

An interesting feature of the text is the way in which different technical terms are used. Thus *māl*, which properly means "wealth," is used by Ibn Badr not only in the sense of "capital," but also (*e.g.* text p. 18, line 1) in the sense of x^2, and this even when x is a quadratic surd. Does this arise from marshalling troops in squadrons, or possibly from reducing areas to equivalent squares? Other terms are noted by the editor.

So far as we can judge, the editor's work seems to be very well done. Besides the text and translation we have an introduction describing the (unique) MS., now in the Escurial Library, photographic facsimiles of the first and last pages, a very useful summary of the contents (using modern notation), and a few notes on the history of mathematics in Spain.

This and other recently published works indicate that Spain is becoming really alive to the value of scientific research; it may be added that it appears under the auspices of the *Junta para ampliación de estudios e investigaciones cientificas.*

G. B. M.

OUR BOOKSHELF.

Cours de Manipulations de Chimie Physique et d'Electrochimie. Par M. Centnerszwer. Pp. 182. (Paris: Gauthier-Villars et Cie, 1914.) Price 6 francs.

WHEN a student actually measures the quantities involved in theory, a flood of light is frequently thrown on hitherto obscure points, and the object of the present practical course is to assist in the study of theory rather than to provide a training in manipulation. The book is orthodox according to the Ostwald school. It has been gradually evolved from teaching experience in the Riga Polytechnic, and meets with the approval of Walden. It thus has much to commend it.

Following the well-known Leipzig lines, it presents mostly familiar features, except that it is almost unique among books on practical physical chemistry in giving exercises on the measurement of critical constants. No other practical book, except Ostwald-Luther, so far as we are aware, deals with this subject, and in the short practical course at Leipzig the exercises on critical constants are marked as optional. The author's special experience in this field no doubt accounts for this novelty, and what makes it the more welcome is that the methods described have been put to the test.

Practical details are very fully given in the part on electrochemistry, which occupies 77 out of a total of 182 pages. We note, however, that a table of absolute potentials for elements is given instead of the more trustworthy and equally practicable potentials relative to the hydrogen electrode. This is possibly due to the elementary nature of the work, just as in most elementary books on general chemistry it is not considered wise to confuse the beginner by giving arguments in favour of the oxygen basis for atomic weights. The same desire for simplicity also explains the absence of reference to the degree of uncertainty in experimental results.

FRANCIS W. GRAY.

The Nation of the Future: a Survey of Hygienic Conditions and Possibilities in School and Home Life. By L. Haden Guest. Pp. 115. (London: G. Bell and Sons, Ltd., 1916.) Price 2*s*. net.

THIS little book, clothed in an ambitious and somewhat misleading title, deals entirely with the welfare of the school child and with the medical inspection and treatment of school children.

The first section deals with the disabilities to which school children are subject, their results, their treatment, and their prevention.

In the second section the method of carrying out the medical inspection of school children is described, the system being that which has been adopted by the London County Council. Finally, the case for the school clinic is presented to the reader.

The book is a popular one suited to the requirements of education committees, teachers, and health visitors, and as such may be useful. The text is illustrated with several plates.

Stars at a Glance. Pp. 48. (London: G. Philip and Son, Ltd., n.d.) Price 1*s*. net.

THIS simple guide to the stars will admirably meet the requirements of those who are commencing the study of astronomy or who have become interested in the heavens since the lighting restrictions came into operation. It provides an "aspect chart" for each month, which will enable the observer to make a general acquaintance with the stars visible at a specified time and date, and four additional charts showing the constellations in greater detail. An important feature is a calendar-index, whereby the proper chart to be consulted at any time may easily be selected. In conjunction with a compass-card which is provided, the charts may be conveniently used for purposes of night-marching. The text includes a useful introduction to the study of the heavens and some brief notes on the constellations and principal stars.

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